FIG. 1A

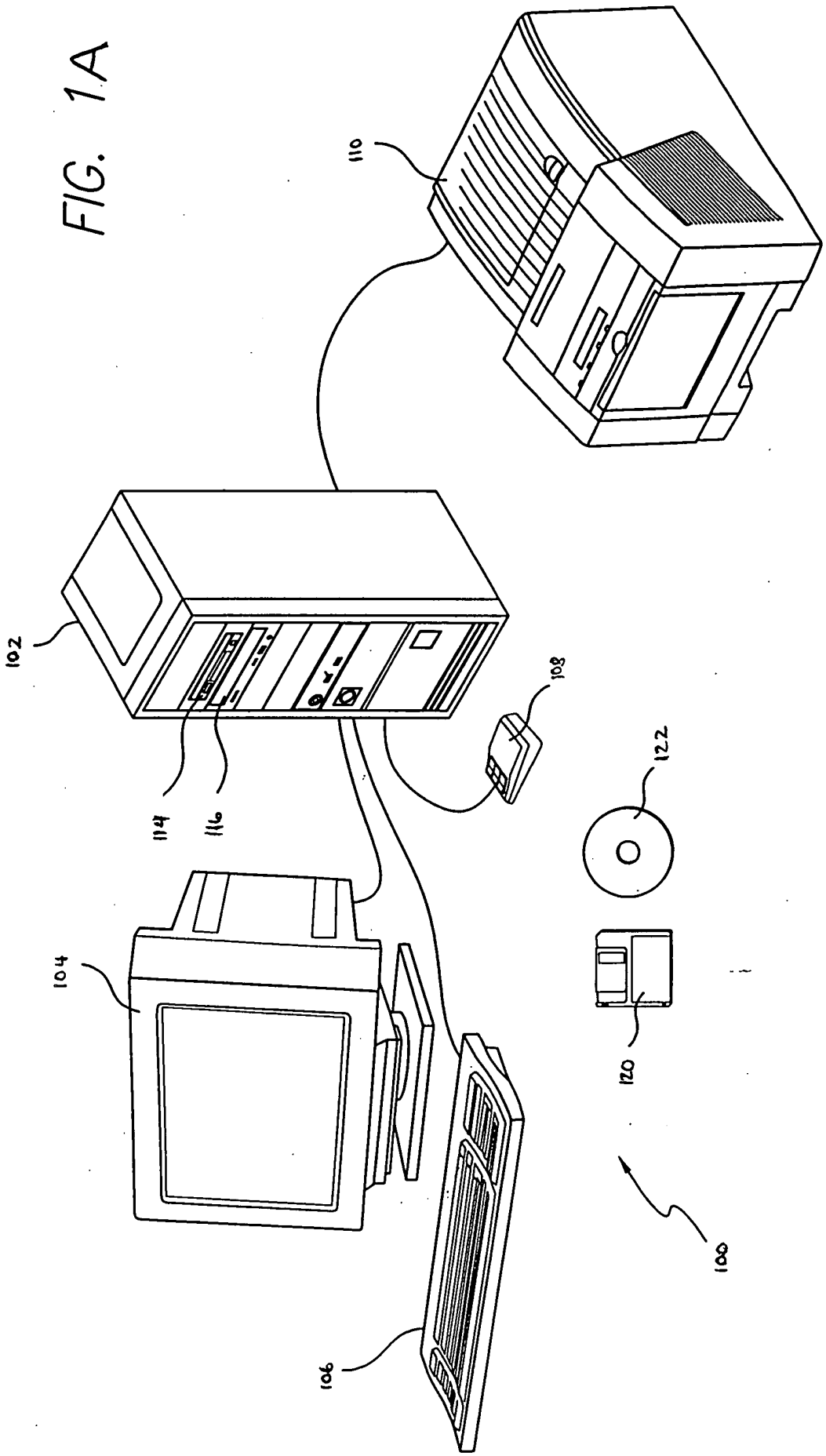
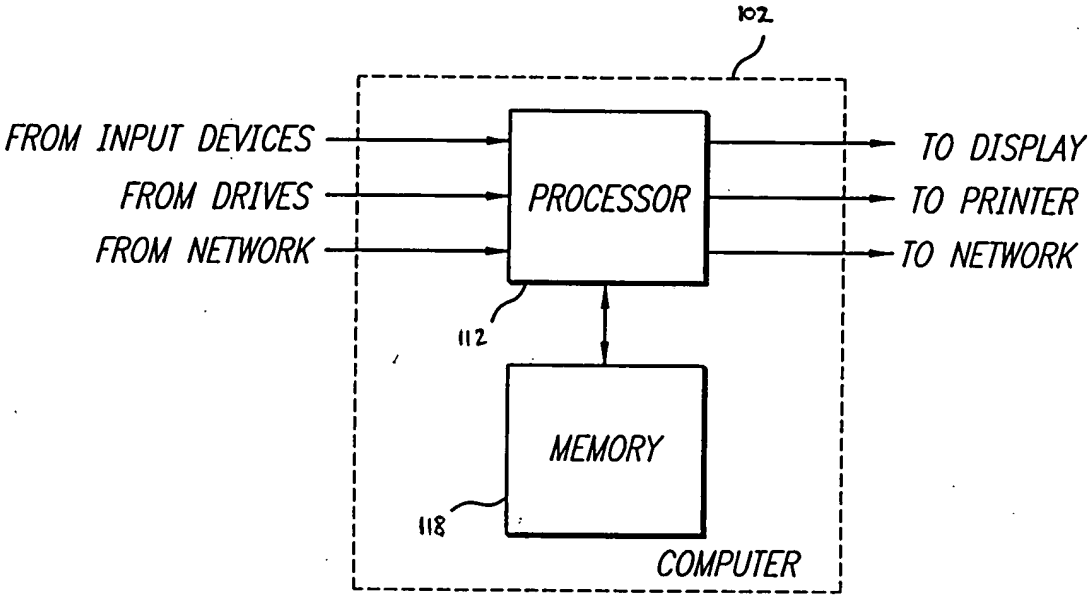


FIG. 1B


102
FROM INPUT DEVICES
FROM DRIVES
FROM NETWORK
PROCESSOR
TO DISPLAY
TO PRINTER
TO NETWORK
112
MEMORY
118
COMPUTER

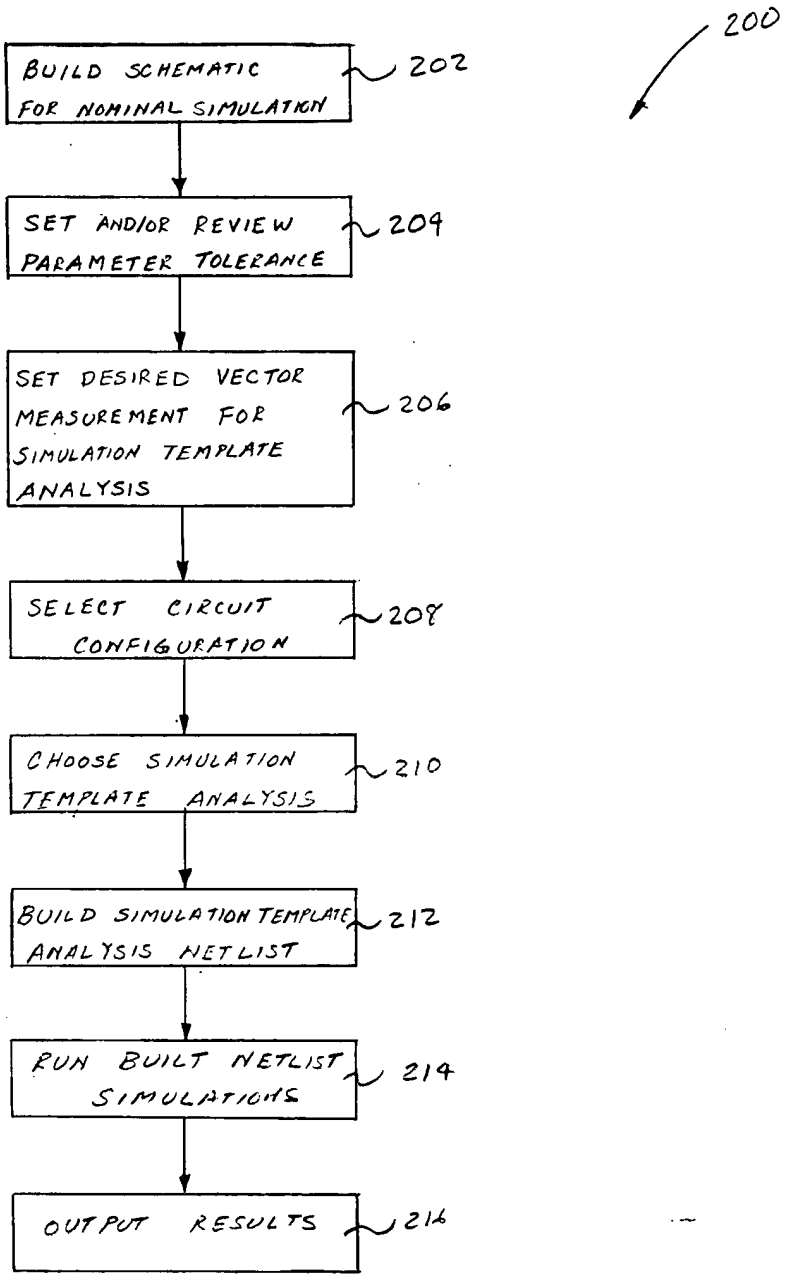

200
BUILD SCHEMATIC FOR NOMINAL SIMULATION
202
SET AND/OR REVIEW PARAMETER TOLERANCE
204
SET DESIRED VECTOR MEASUREMENT FOR SIMULATION TEMPLATE ANALYSIS
206
SELECT CIRCUIT CONFIGURATION
208
CHOOSE SIMULATION TEMPLATE ANALYSIS
210
BUILD SIMULATION TEMPLATE ANALYSIS NETLIST
212
RUN BUILT NETLIST SIMULATIONS
214
OUTPUT RESULTS
216

FIGURE 2

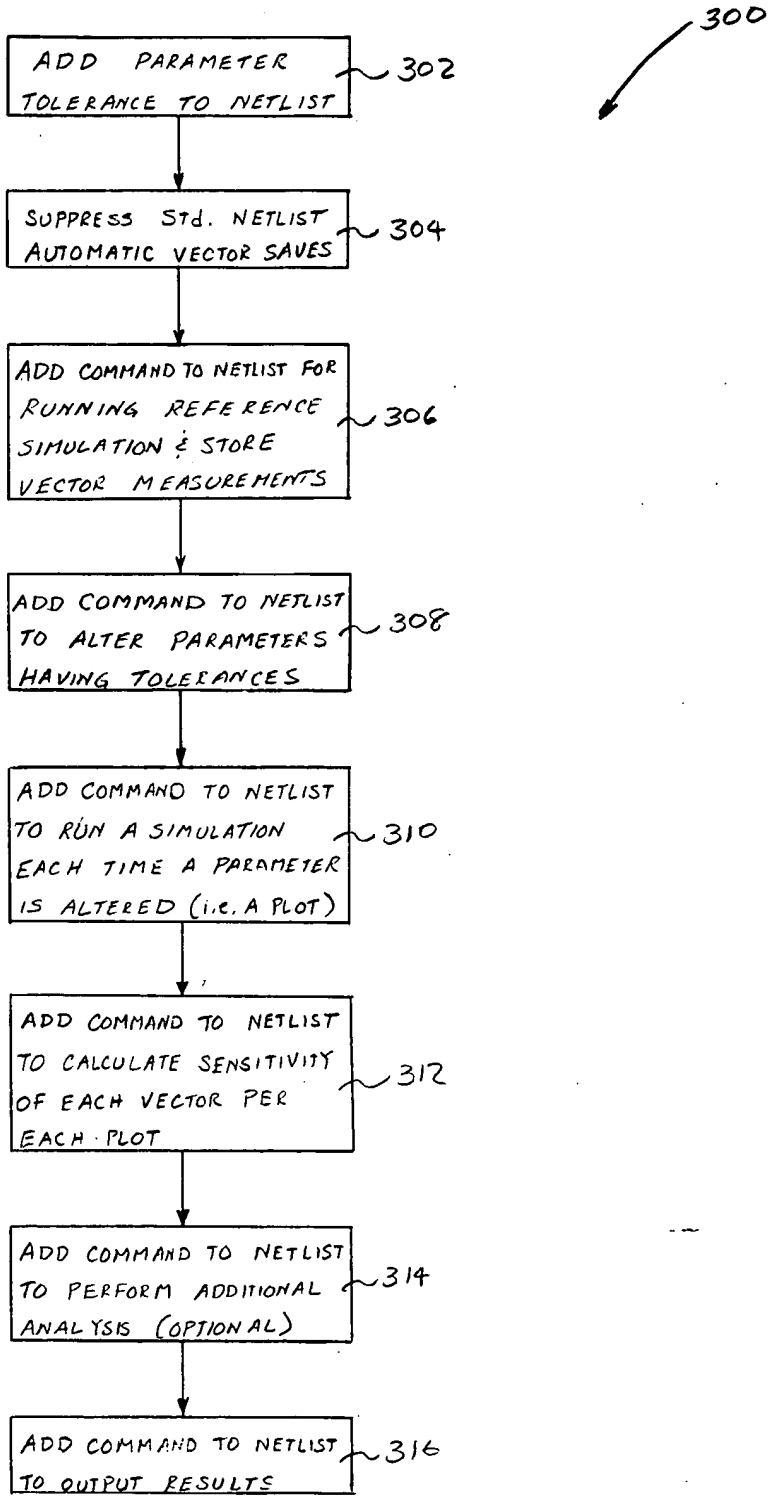

300
ADD PARAMETER TOLERANCE TO NETLIST
302
SUPPRESS Std. NETLIST AUTOMATIC VECTOR SAVES
304
ADD COMMAND TO NETLIST FOR RUNNING REFERENCE SIMULATION & STORE VECTOR MEASUREMENTS
306
ADD COMMAND TO NETLIST TO ALTER PARAMETERS HAVING TOLERANCES
308
ADD COMMAND TO NETLIST TO RUN A SIMULATION EACH TIME A PARAMETER IS ALTERED (i.e. A PLOT)
310
ADD COMMAND TO NETLIST TO CALCULATE SENSITIVITY OF EACH VECTOR PER EACH PLOT
312
ADD COMMAND TO NETLIST TO PERFORM ADDITIONAL ANALYSIS (OPTIONAL)
314
ADD COMMAND TO NETLIST TO OUTPUT RESULTS
316

FIGURE 3

SENS, sensitivity analysis Simulation Template With Comments:

FIGURE 4-1

400

```
*Instruct the netlist builder to show tolerances                    } 402
#tolerance

*Suppress automatic vector saves                                    } 404
#nosave

*Suppress IsSpice4 printout                                         } 406
#noprint

*Save vectors needed for measurements                               } 408
#vector

*Set the output file pointer to the beginning to remove             } 410
* the input net list
set rewind

*Set the  noecho environment for print formatting                   } 412
set noecho

*Run the specified simulation and save the results                  } 414
#simulation
set printmode = save
#mprint

*Rename the simulation plot                                         } 416
nameplot ref

*Set the print format                                               } 418
SET COLWIDTH=22
SET SPICEDIGITS=5

*Tell the user where we are
printstatus -t ########_sensitivity_for_each_parameter_########    } 420

*Loop through all of the parameters                                 } 422
nextparam null
while param <> null
    *Alter each parameter
    alterparam tolerance(param)/3
    *Simulate
    #simulation
    Save the parameter reference in the new plot
    paramvec = param
    *Tell the user where we are
    printstatus -p paramvec
    *Save the data
    #mprint
    *Loop through the vectors
    nv = nextvector(null)
    while nv <> null
        *Save the sensitivities of scalar data
        if length(nv) = 1
            nv = nv - ref.nv
```

FIGURE 4-2

```
            end; end if
            *Get the next vector
            nv = nextvector(nv)
        end ; end vector loop
        *Restore the parameter
        unalterparam
        *Get the next parameter
        nextparam
end; end parameter loop
*Set print mode for printing output data
set printmode = print
unset noecho
*Loop through the plots
pl = nextplot(null)
while pl <> null
    if sameplot(ref.default) = 0
        *Loop through the vectors
        nv = nextvector(null)
        while nv <> null
            if length(nv) = 1
                *Save the sensitivities
                if ref.nv <> 0
                    nv = (300*NV)/REF.NV
                 else
                    nv = 3*NV
                 end ; end if
              end ; end if
              nv = nextvector(nv)
         end ; end vector loop
    end; end if
    *Get next plot
    pl = nextplot(pl)
end ; end plot loop
*Tell the user what's going on
printstatus -t ########sorting_sensitivity_for_each_parameter_##
printstatus -t
*Make ref the current plot
setplot ref
*Sort by descending value
sort -vd
*Loop through the plots
pl = nextplot(null)
while pl <> null
   if sameplot(ref.default) = 0
      *Print Headers
      SETPARAM PARAMVEC
      printstatus -p paramvec
      ECHO
      ECHO -u "**********SENSITIVITY DATA**********"
      ECHO
      ECHO -un "PARAMETER NAME: "
      PRINTNAME PARAMVEC
      ECHO
      ECHO -un " NOMINAL VALUE: "
```

424

426

428

FIGURE 4-3

```
        PRINTVAL  PARAMVEC
        ECHO
        ECHO
        PRINTTEXT -u VECTOR SENSITIVITY%
        ECHO
        ECHO
        *Sort by descending data value
        sort -vd
       *Loop through the vectors and print data
        nv = nextvector(null)
        while nv <> null
           if length(nv) = 1
               if ref.nv <> 0
                   PRINTNAME NV
                   PRINTVAL NV
               else
                   PRINTNAME NV
                   PRINTVAL NV
                   ECHO -n *
               end ; end if
               ECHO
            end ; end if
            *Get next vector
            nv = nextvector(nv)
        end; end vector loop
    end ; end if
    *Get next plot
    pl = nextplot(pl)
end; end plot loop
ECHO
ECHO
*Print data in output file for SpiceNet to read
setplot ref
echo ########## SENSITIVITY analysis Results ##############
#mprint
```

430

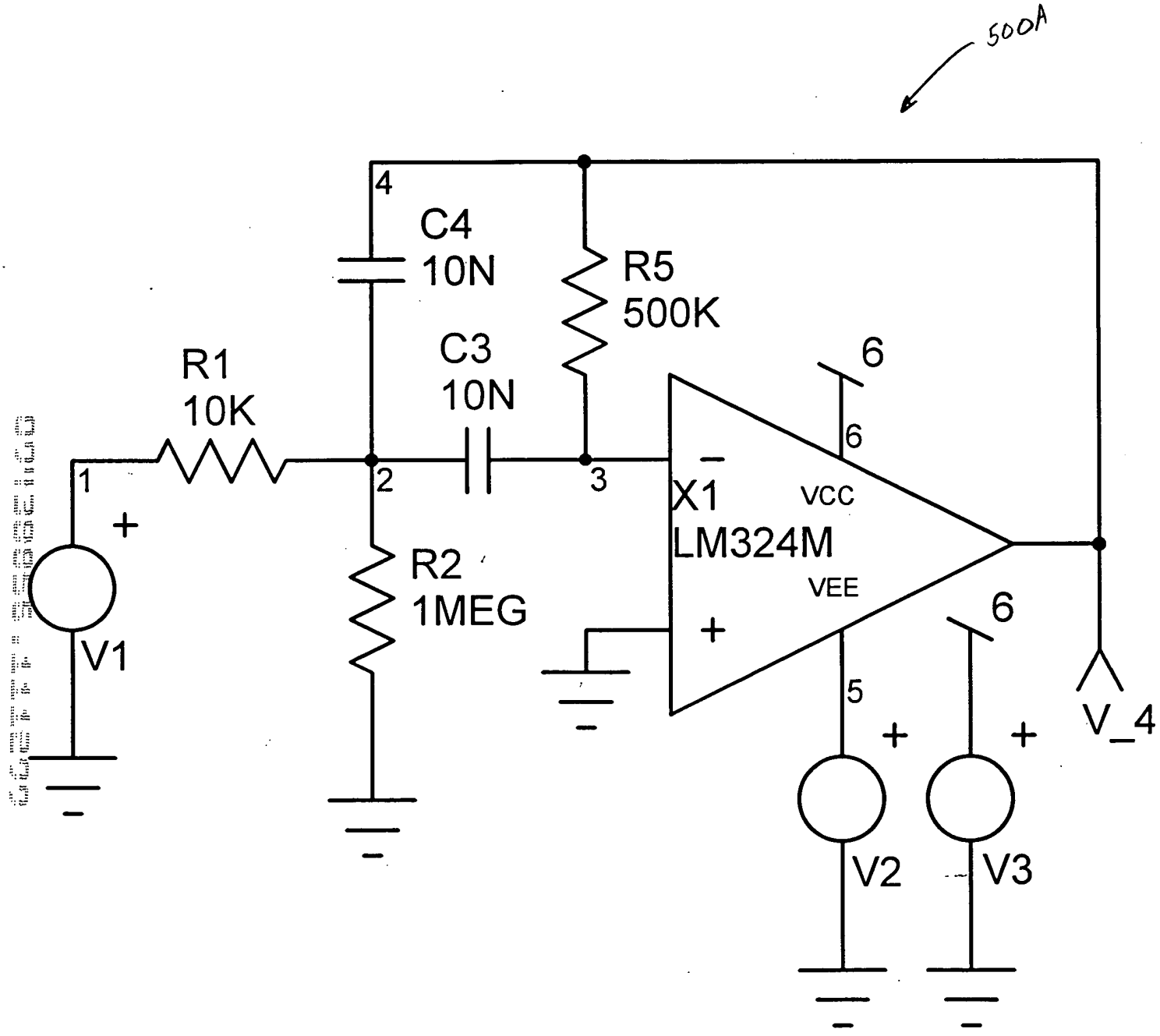

500A
4
C4
10N
R5
500K
C3
10N
R1
10K
6
6
1
2
3
X1
LM324M
VCC
VEE
R2
1MEG
V1
5
6
V2
V3
V_4

FIGURE 5A

```
C:\spice8d\Circuits\Bandpass.cir Setup1
*#save V(2) V(3) @C3[i] @C3[p] V(1) @R1[i] @R1[p] V(4)
*#save @C4[i] @C4[p] @R2[i] @R2[p] @R5[i] @R5[p] V(6) V(5)
*#save @V1[i] @V1[p] @V2[p] @V3[i] @V3[p]
*#alias v_4  v(4)
*#view  tran v_4
.TRAN .05ms 20ms
.PRINT AC VDB(4)
.OPTIONS vscale=4
.PRINT  TRAN V_4
C3 2 3 10N
R1 1 2 10K
C4 2 4 10N
R2 2 0 1MEG
R5 3 4 500K
X1 0 3 6 5 4 LM324M {  }
.SUBCKT LM324M  1 2 3 4 5
*
C1   11 12 3.000E-12
C2    6  7 6.000E-12
CEE  10 99 315.8E-15
DC    5 53 DX
DE   54  5 DX
DLP  90 91 DX
DLN  92 90 DX
DP    4  3 DX
EGND 99  0 POLY(2) 3 0   4 0  0 .5 .5
FB    7 99 POLY(5) VB VC VE VLP VLN 0 53.05E6
+ -50E6 50E6 50E6 -50E6
GA    6  0 11 12 37.70E-6
GCM   0  6 10 99 11.92E-9
IEE   3 10 DC 2.476E-6
HLIM 90  0 VLIM 1K
Q1   11  2 13 QX
Q2   12  1 14 QX
R2    6  9 100.0E3
RC1   4 11 26.53E3
RC2   4 12 26.53E3
RE1  13 10 4.820E3
RE2  14 10 4.820E3
REE  10 99 80.78E6
RO1   8  5 50
RO2   7 99 50
RP    3  4 34.71E3
VB    9  0 DC 0
VC    3 53 DC 2
VE   54  4 DC 5.000E-3
VLIM  7  8 DC 0
VLP  91  0 DC 40
VLN   0 92 DC 40
.MODEL DX D(IS=800.0E-18)
.MODEL QX PNP(IS=800.0E-18 BF=31.58)
.ENDS
V1 1 0 AC=1 PULSE 0 -1 1MS
V2 5 0 DC=-5
V3 6 0 DC=5
.END
```

502

504

506

508

500B

FIGURE 5B

FIGURE 6-1

```
C:\spice8d\Circuits\Bandpass.cir Setup1
.OPTIONS vscale=4
.control
alias v_4  v(4)
view  tran v_4
save v(4)                                   608

set rewind                                  610
set noecho                                  612
TRAN .05ms 20ms

set printmode = save
echo TRAN Analysis Measurements
echo                                        614
echo Test 1 Mean
homeCursors
print  Mean(V(4))

nameplot ref                                616

SET COLWIDTH=22                             618
SET SPICEDIGITS=5

printstatus -t ########_sensitivity_for_each_parameter_########  620
nextparam null
while param <> null
    alterparam tolerance(param)/3
    TRAN .05ms 20ms

    paramvec = param
    printstatus -p paramvec
    echo TRAN Analysis Measurements
echo                                        622
echo Test 1 Mean
homeCursors
print  Mean(V(4))

    nv = nextvector(null)
    while nv <> null
    if length(nv) = 1
        nv = nv - ref.nv
        end
    nv = nextvector(nv)
    end
    unalterparam
    nextparam
end
set printmode = print
unset noecho

pl = nextplot(null)
while pl <> null
    if sameplot(ref.default) = 0

        nv = nextvector(null)

        while nv <> null
            if length(nv) = 1                624
                if ref.nv <> 0
                    nv = (300*NV)/REF.NV
                else
                    nv = 3*NV
                end
            end
            nv = nextvector(nv)
        end
    end
    pl = nextplot(pl)
end

printstatus -t ########sorting_sensitivity_for_each_parameter_########
printstatus -t                                                          626

setplot ref
```

600

FIGURE 6-2

```
sort -vd

pl = nextplot(null)
while pl <> null
    if sameplot(ref.default) = 0

        SETPARAM PARAMVEC

        printstatus -p paramvec

        ECHO
        ECHO -u "**********SENSITIVITY DATA**********"
        ECHO
        ECHO -un "PARAMETER NAME: "
        PRINTNAME PARAMVEC
        ECHO
        ECHO -un " NOMINAL VALUE: "
        PRINTVAL  PARAMVEC
        ECHO
        ECHO
        PRINTTEXT -u VECTOR SENSITIVITY%
        ECHO
        ECHO

        sort -vd
        nv = nextvector(null)

        while nv <> null
            if length(nv) = 1
                if ref.nv <> 0
                    PRINTNAME NV
                    PRINTVAL NV
                else
                    PRINTNAME NV
                    PRINTVAL NV
                    ECHO -n *
                end
                ECHO
            end
            nv = nextvector(nv)
        end

    end
    pl = nextplot(pl)
end

ECHO
ECHO

setplot ref
echo ########## SENSITIVITY analysis Results #############
echo TRAN Analysis Measurements
echo
echo Test 1 Mean
homeCursors
print  Mean(V(4))


.endc
C3 2 3 10N TOL=5%
R1 1 2 10K TOL=2%
C4 2 4 10N TOL=5%
R2 2 0 1MEG TOL=2%
R5 3 4 500K TOL=2%
X1 0 3 6 5 4 LM324M {  }
.SUBCKT LM324M  1 2 3 4 5
*
C1   11 12 3.000E-12
C2    6  7 6.000E-12
CEE  10 99 315.8E-15
DC    5 53 DX
DE   54  5 DX
DLP  90 91 DX
DLN  92 90 DX
DP    4  3 DX
EGND 99  0 POLY(2) 3 0   4 0  0 .5 .5
FB    7 99 POLY(5) VB VC VE VLP VLN 0 53.05E6
```

628

630

632

FIGURE 6-3

```
+ -50E6 50E6 50E6 -50E6
GA     6   0 11 12 37.70E-6
GCM    0   6 10 99 11.92E-9
IEE    3 10 DC 2.476E-6
HLIM 90   0 VLIM 1K
Q1    11   2 13 QX
Q2    12   1 14 QX
R2     6   9 100.0E3
RC1    4 11 26.53E3
RC2    4 12 26.53E3
RE1   13 10 4.820E3
RE2   14 10 4.820E3
REE   10 99 80.78E6
RO1    8   5 50
RO2    7 99 50
RP     3   4 34.71E3
VB     9   0 DC 0
VC     3 53 DC 2
VE    54   4 DC 5.000E-3
VLIM   7   8 DC 0
VLP   91   0 DC 40
VLN    0 92 DC 40
.MODEL DX D(IS=800.0E-18)
.MODEL QX PNP(IS=800.0E-18 BF=31.58)
.ENDS
V1 1 0 AC=1 PULSE 0 -1 1MS
V2 5 0 DC=-5
V3 6 0 DC=5
.END
```

FIGURE 7

```
**********SENSITIVITY DATA**********

PARAMETER NAME:                    r5
 NOMINAL VALUE:                500.00K

                VECTOR          SENSITIVITY%

            mean(v(4))                1.5111

**********SENSITIVITY DATA**********

PARAMETER NAME:                    r2
 NOMINAL VALUE:             1.0000Meg

                VECTOR          SENSITIVITY%

            mean(v(4))               17.265M

**********SENSITIVITY DATA**********

PARAMETER NAME:                    c4
 NOMINAL VALUE:               10.0000N

                VECTOR          SENSITIVITY%

            mean(v(4))              -752.77M

**********SENSITIVITY DATA**********

PARAMETER NAME:                    r1
 NOMINAL VALUE:               10.0000K

                VECTOR          SENSITIVITY%

            mean(v(4))              -571.46M

**********SENSITIVITY DATA**********

PARAMETER NAME:                    c3
 NOMINAL VALUE:               10.0000N

                VECTOR          SENSITIVITY%

            mean(v(4))                4.5201


########## sensitivity analysis results ##############
tran analysis measurements

test 1 mean
mean(v(4)) = 2.086052e-001

Total run time: 0.583 seconds.

Total run time: 0.583 seconds.

Memory remaining = 1996210 Kbytes
Memory Used      =  14401 Kbytes
```

RSS, root summed square analysis Simulation Template With Comments:

FIGURE 8-1

```
*Instruct the netlist builder to show tolerances                    802
#tolerance

*Suppress automatic vector saves                                    804
#nosave

*Suppress IsSpice4 printout                                         806
#noprint

*Save vectors needed for measurements                               808
#vector

*Set the output file pointer to the beginning to remove             810
* the input net list
set rewind

*Set the  noecho environment for print formatting                   812
set noecho

*Run the specified simulation and save the results                  814
#simulation
set printmode = save ,
#mprint

*Set the print format                                               818
SET COLWIDTH=22
SET SPICEDIGITS=5

*Rename the simulation plot                                         816
nameplot ref

*Loop through all of the parameters
nextparam null
*Tell the user where we are                                         820
printstatus -t "######## sensitivity for each parameter ########"
while param <> null
     *Alter each parameter
     alterparam tolerance(param)/3
     *Simulate
     #simulation
    *Save the parameter reference in the new plot                   822
     paramvec = param
     *Tell the user where we are
     printstatus -p paramvec
     *Save the data
     #mprint
     *Loop through the vectors
     nv = nextvector(null)
     while nv <> null
```

FIGURE 8-2

```
            *Save the sensitivities of scalar data
              if length(nv) = 1
                  nv = nv - ref.nv
            end ; end if
            *Get the next vector
            nv = nextvector(nv)
        end ; end vector loop
        *Restore the parameter
        unalterparam
        *Get the next parameter
        nextparam
end ; end parameter loop
*Set print mode for printing output data
set printmode = print
unset noecho
*Make a new plot for rss data and make it the current plot
newplot rss ref.default ref.default
setplot rss
*Loop through the vectors
nv = nextvector(null)
while nv <> null
        *Initialize the scalar data to zero
        IF LENGTH(NV) = 1
            nv = 0
        END ; end if
        * Get the next vector
        nv = nextvector(nv)
end ; end vector loop
*Loop through the plots
pl = nextplot(null)
*Tell the user where we are
printstatus -t "######## computing rss for each measurement ####"
while pl <> null
        *Select plots
        if sameplot(rss.default) = 0
            if sameplot(ref.default) = 0
                  *Tell the user what we are doing
                  printstatus -l pl
                  *Make the saved parameter reference, paramvec current
                  SETPARAM PARAMVEC
                  *Get the next vector
                  nv = nextvector(null)
                  *Print formatted data
                  ECHO
                  ECHO -U "**********RSS DATA**********"
                  ECHO
                  ECHO -UN " PARAMETER NAME: "
                  PRINTNAME PARAMVEC
                  ECHO
                  ECHO -UN "  NOMINAL VALUE: "
                  PRINTVAL  PARAMVEC
                  ECHO
                  ECHO -UN "TOLERANCE VALUE: "
                  PRINTTOL  PARAMVEC
```

824

832

826'

828'

FIGURE 8-3

```
                ECHO
                ECHO
                PRINTTEXT -UN VECTOR
                PRINTTEXT -U SENSITIVITY% RSS_CONTRIBUTION
                ECHO
                ECHO
                *Loop through vectors
                while nv <> null
                    if length(nv) = 1
                        IF REF.NV <> 0
                            *Calculate the RSS percentage if value is not zero
                            PRINTNAME NV
                            NEWNV = (300*NV)/REF.NV
                            PRINTVAL NEWNV
                        ELSE
                            *Calculate the RSS  if value is not zero
                            PRINTNAME NV
                            NEWNV = 3*NV
                            PRINTVAL NEWNV
                            ECHO -N *
                        END ;end if
                        *Save and print the sum of squares
                        rss.nv = rss.nv + nv * nv
                        PRINTVAL RSS.NV
                        ECHO
                    end ;end if
                    * Get next vector
                    nv = nextvector(nv)
                end ;end vector loop
                * Sort plot by descending value
                sort -vd
            end ;end if
        end ;end if
        * Get next plot
        pl = nextplot(pl)
end ;end plot loop
*Sort the rss plot by descending value
setplot rss
SORT -VD
*Print Headers
ECHO
ECHO -U "**********RSS HI/LO ANALYSIS RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
SET COLWIDTH=15
PRINTTEXT -U NOMINAL RSS-VALUE TOLERANCE% HI_VALUE LO_VALUE
ECHO
ECHO
*Make a new plot for results
newplot hirss ref.default ref.default
*Loop through the vectors
nv = nextvector(null)
while nv <> null
      if length(nv) = 1
```

834

FIGURE 8-4

```
        *Print formatted data
        SET COLWIDTH=22
              PRINTNAME NV
        SET COLWIDTH=15
        PRINTVAL REF.NV
              NV = 3 * SQRT(ABS(NV))
        PRINTVAL NV
              IF REF.NV <> 0
              NEWNV1 = (100*NV)/REF.NV
        ELSE
              NEWNV1 = NV*0
        END
        PRINTVAL NEWNV1
           NV = REF.NV + NV
        HI_RSS = REF.NV + NV
        LO_RSS = REF.NV - NV
        PRINTVAL HI_RSS
        PRINTVAL LO_RSS
        ECHO
      end ; end if
      *Get next vector
      nv = nextvector(nv)
end; end vector loop
ECHO
ECHO
*Print data in output file for SpiceNet to read
setplot hirss
echo ########## RSS HI analysis Results #############
#mprint
RUSAGE ELAPSED
```

830'

EVA, Extreme Value Analysis Simulation Template With Comments:

FIGURE 9-1

```
*Instruct the netlist builder to show tolerances
#tolerance

*Suppress automatic vector saves
#nosave

*Suppress IsSpice4 printout
#noprint

*Save vectors needed for measurements
#vector

Set the noecho environment for print formatting
set rewind
set noecho

*Run the specified simulation and save the results
#simulation
pltype = 0 ;Identify the plot type for later use
set printmode = save
#mprint

*Set the print format
SET COLWIDTH=22
SET SPICEDIGITS=5
nameplot ref
newplot evahi ref.default ref.default
evahi.pltype = 0 ;Identify the plot type for later use
*Print status for the user
printstatus -t "######## sensitivity for each parameter ########"
*Loop through the parameters
nextparam null
while param <> null
    *Alter each parameter
    alterparam tolerance(param)/3
    *Simulate, making a new plot for results
    #simulation
    *Save the current parameter reference
    paramvec = param
    *Tell the user where we are
    printstatus -p paramvec
    *Save the tol and paramval
    paramtol = tolerance(param)
    paramval = getparam(param)
    pltype = 1 ;Identify the plot type for later use
    *Save the simulation results
```

FIGURE 9-2

```
    #mprint
    *Loop through all the vectors
    nv = nextvector(null)
    while nv <> null
        *Save the sensitivities for all scalar measurements except pltype
        if length(nv) = 1
            if nv <> pltype
                nv = nv - ref.nv
            end ;end if
        end ;end if
        nv = nextvector(nv)
    end ;end vector loop
    *Restore the param
    unalterparam
    *Get the next param
    nextparam
end;end parameter loop
*Make ref the current plot
setplot ref
*Loop through the vectors in ref
nv = nextvector(null)
*Tell the user where we are
printstatus -t "######## measurements ########"
while nv <> null
    if length(nv) = 1
        *Loop through all the plots containing scalar vectors
        pl = nextplot(null)
        while pl <> null
            if pltype = 1
* the inner loop, we are looping through each sensitivity plot looking at the same vector
* we will alter the parameter id'd by paramvec to maximize/minimize the vector
                setparam paramvec
                *Change each parameter to its worst case extreme value
                if nv >= 0
                    alterparam paramtol
                else
                    alterparam -paramtol
                end
            end
            pl = nextplot(pl)
        end
        *Simulate for the extreme case and save the data in a new plot
        #simulation
        #mprint
        pltype = 2 ;Identify the plot type for later use
* if we want sensitivity at the extreme, we weed to go through each param
* and change it to be a bit different than it is at the extreme, run a simulation ,
* and mark it as pltype 3 along with its paramvec, then we can take the diff
* from the pltype = 2 to get the sensitivity at the extreme if the sign at the extreme
```

934

FIGURE 9-3

```
* is different than at the nominal, we can report an error or go on to do worst case
* for worst case, we need to reduce the param change by 1/2 and do this over again...
* either continue in this loop or make a wc loop afterward... save the paramvalue
* and tolerance
          evahi.nv = nv
          if nv <> pltype
              *Tell the user where we are
               printstatus -n nv
          end ;endif
      end ;end plot loop
      ;get the next vector
      nv = nextvector(nv)
end ;end vector loop
*Set print mode and print header
set printmode = print
unset noecho
setplot EVAHI
ECHO
ECHO -U "**********EVA PARAMETER LIST**********"
ECHO
PRINTTEXT -UN PARAMETER
PRINTTEXT -U NOMINAL TOLERANCE
ECHO
ECHO
*Loop through the parameters
nextparam null
while param <> null
     *Extract the saved param reference and print its data
     paramvec = param
     PRINTNAME PARAMVEC
     PRINTVAL  PARAMVEC
     PRINTTOL  PARAMVEC
     ECHO
     *get the next param
     nextparam
end ;end param loop
ECHO ;print a blank line
*Make a new plot to hold sorted results
newplot evasort ref.default ref.default
*Make ref the current plot
setplot REF
*Loop through all vectors in ref
nv = nextvector(null)
while nv <> null
     if length(nv) = 1
          *save the result in evasort as a percent of its value
          if ref.nv <> 0
               evasort.nv = ((evahi.nv-ref.nv)*100)/ref.nv
```

936

938

FIGURE 9-4

```
        else
            evasort.nv = 0;
        end ;end if
    end ;end if
    *Get the next vector
    nv = nextvector(nv)
end ;end vector loop
*Print some headers
ECHO
ECHO -U "**********EVA-HI RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
PRINTTEXT -U NOMINAL EVA-HI CHANGE%
ECHO
ECHO
setplot evasort
*Sort evasort by descanting data
sort -VD
*Loop through the vectors
nv = nextvector(null)
while nv <> null
    *If its the correct data in the correct plot, print it
    if length(nv) = 1
        if nv <> pltype
            PRINTNAME NV
            PRINTVAL  REF.NV
            PRINTVAL  EVAHI.NV
            PRINTVAL  EVASORT.NV
            ECHO
        end ; end if
    end ; end if
    *Get the next vector
    nv = nextvector(nv)
end ; end vector loop
ECHO
ECHO

* now the eva results are in pltype = 2 plots
*Print the results so SpiceNet can read the eva-hi data
set printmode = print
unset noecho
setplot evahi
echo ########## EVA HI analysis Results ##############
#mprint
```

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WCS, Worst Case by Sensitivity Simulation Template With Comments:

FIGURE 10-1

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```
*Instruct the netlist builder to show tolerances                    } 1002
#tolerance

*Suppress automatic vector saves                                    } 1004
#nosave

*Suppress IsSpice4 printout                                         } 1006
#noprint

*Save vectors needed for measurements                               } 1008
#vector

*Set the output file pointer to the beginning to remove             } 1010
* the input net list
set rewind

*Set the  noecho environment for print formatting                   } 1012
set noecho

*Run the specified simulation and save the results                  } 1014
#simulation
set printmode = save
#mprint

*Set the print format                                               } 1018
SET COLWIDTH=22
SET SPICEDIGITS=5

*Rename the simulation plot                                         } 1016
nameplot ref

*Make a newplot for results                                         } 1032
newplot result ref.default ref.default

*Set the current plot to ref                                        } 1034
setplot ref

*Print status for the user
printstatus -t "######## sensitivity for each parameter ########"   } 102

*Loop through the parameters                                        } 1022'
nextparam null
while param <> null
     *Alter each parameter
     alterparam tolerance(param)/3
     *Simulate, making a new plot for results
          #simulation
     *Save the current parameter reference
          paramvec = param
     *Inform the user about what's being done
          printstatus -p paramvec
     *Make and save the measurements
     #mprint
```

FIGURE 10-2

```
    *Loop through the vectors
    nv = nextvector(null)
          while nv <> null
        *Save the sensitivity of scalar quantities
          if length(nv) = 1
              nv = nv - ref.nv
              *Save the worst case -hi value
              result.nv = result.nv + abs(3*nv)
        end ;end if
        nv = nextvector(nv)
    end ;end vector loop
    *restore the parameter value
    unalterparam
    *get the next parameter
    nextparam
end ;end parameter loop
```

```
*Set the print mode to print instead of save
set printmode = print
*Restore the echo mode for printing
unset noecho
*Set result to the current plot
setplot result
*Print the header
ECHO
ECHO -U "**********WCS PARAMETER LIST**********"
ECHO
PRINTTEXT -UN PARAMETER
PRINTTEXT -U NOMINAL TOLERANCE
ECHO
ECHO
*Loop through the parameters
nextparam null
while param <> null
      paramvec = param
        *Print the row
        PRINTNAME PARAMVEC
        PRINTVAL  PARAMVEC
        PRINTTOL  PARAMVEC
    ECHO
    nextparam
end
ECHO
```

1036

```
*Make a new plot to hold sorted results
newplot wcsort ref.default ref.default
*Set the current plot to ref
setplot REF
*Loop through its vectors
nv = nextvector(null)
while nv <> null
    *Calculate the wc as a percent change results
    if length(nv) = 1
        if ref.nv <> 0
            wcsort.nv = ((result.nv-ref.nv)*100)/ref.nv
```

1038

FIGURE 10-3

```
        else
            wcsort.nv = 0;
          end ;end if
    end ;end if
      nv = nextvector(nv)
end ;end vector loop

*Print headers
ECHO
ECHO -U "**********WCS-HI RESULTS**********"
ECHO
PRINTTEXT -UN VECTOR
PRINTTEXT -U NOMINAL WCS-HI CHANGE%
ECHO
ECHO
;sort wcsort by descending value
setplot wcsort
sort -VD
*Print the ordered list
nv = nextvector(null)
while nv <> null
    if length(nv) = 1
        PRINTNAME NV
        PRINTVAL  REF.NV
        PRINTVAL  RESULT.NV
        PRINTVAL  WCSORT.NV
          ECHO
    end
      nv = nextvector(nv)
end
ECHO
ECHO
*Set the current plot to the wc results
setplot result
echo ########## WCS HI analysis Results #############
*Print the measured results in a form that can be read back
*into SpiceNet
#mprint
*Report the elapsed time in the output file
rusage elapsed
```

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